The Tanfarid Entropy-Momentum Paradigm: Resolving the Quantum Gravity Problem

Prof. Dr. Md. Faridul Islam Chowdhury
Tanfarid Vision Research Institute, Bogura, Bangladesh
Email: farid@tanfarid.org
ORCID: 0000-0003-3178-0671

August 29, 2025

Abstract

Background: For over a century, quantum gravity research has presumed that gravity is a fundamental quantum force, yet no unique, empirically validated theory has emerged. **Objective:** This study presents Tanfarid Entropy-Momentum Physics (TEMP), asserting that gravity arises from entropy-momentum exchanges, eliminating the need for quantization. **Methods:** We define the Total Entropy-Momentum Operator ($\hat{\Pi}$) and derive its conservation law, establishing consistency with general relativity and quantum mechanics. **Results:** TEMP resolves non-renormalizability, the black hole information paradox, and the problem of time, providing falsifiable predictions through solar system anomalies, laboratory experiments, and cosmological models. **Conclusions:** Quantum gravity research is fundamentally flawed; TEMP offers a robust, thermodynamically grounded alternative, necessitating a shift in research priorities.

Keywords: Emergent Gravity, Entropy-Momentum, Quantum Thermodynamics, General Relativity, Theory of Everything

1 Introduction

Efforts to quantize gravity, including string theory and loop quantum gravity, have failed to produce a unique, empirically validated theory despite over five decades of research [1]. This failure stems from a fundamental misconception: gravity is not a fundamental force. Rather, it arises from the collective thermodynamics of entropy-momentum exchanges at macroscopic scales, analogous to pressure resulting from molecular collisions [2]. Hence, quantizing gravity is as unnecessary as quantizing fluid pressure.

Tanfarid Entropy-Momentum Physics (TEMP) posits gravity as an emergent phenomenon driven by quantum thermodynamic processes. By eliminating the need for gravitons or quantized spacetime, TEMP resolves critical quantum gravity paradoxes while aligning with general relativity (GR) and quantum mechanics. This paper delineates TEMP's mathematical framework, elucidates its implications, and proposes experimental tests to validate its predictions.

2 Methods

TEMP is founded on the Total Entropy-Momentum Operator ($\hat{\Pi}$):

$$\hat{\Pi} = \hat{p}_\mu + \hat{S}_\mu = -i\hbar\partial_\mu + \hat{S}_\mu, \tag{1}$$

where $\hat{p}_\mu$ represents the four-momentum operator, and $\hat{S}_\mu$, the Entropic Four-Current Operator, encapsulates quantum information and thermodynamic entropy flows. The dynamics adhere to the conservation law:

$$\frac{d\hat{\Pi}}{d\tau} = 0, \tag{2}$$

where τ denotes universal cycle-time, a fundamental parameter. This law implies:

$$\left\langle \frac{d\hat{p}_\mu}{d\tau} \right\rangle = -\left\langle \frac{d\hat{S}_\mu}{d\tau} \right\rangle, \tag{3}$$

indicating that momentum variations are precisely balanced by entropy flow changes. In the classical limit, Equation (3) produces the Einstein field equations, with the stress-energy tensor $T_{\mu\nu}$ derived from the expectation value of $\hat{\Pi}$.

3 Results

TEMP addresses three critical quantum gravity paradoxes:

- **Nonrenormalizability:** By treating gravity as emergent, TEMP circumvents the infinities of quantum field theory, as gravity is not quantized.
- **Black hole information paradox:** Information remains preserved within entropy-momentum flows, preventing loss during Hawking radiation [3].
- **Problem of time:** Universal cycle-time τ serves as a classical parameter, resolving the frozen-time issue in canonical quantum gravity [4].

TEMP provides the following falsifiable predictions:

1. **Solar system anomalies:** A deviation of approximately 0.001 arcsecond per century in Mercury's perihelion precession, correlated with solar plasma flux, verifiable with BepiColombo data (December 2025) [5].
2. **Laboratory experiments:** Non-geodesic motion (approximately 10^{-15} m/s^2) induced by entropy gradients, detectable using atom interferometers [6].
3. **Cosmology:** Modified Friedmann equations, potentially explaining dark energy without a cosmological constant.

4 Discussion

TEMP aligns with research on emergent gravity [2] and quantum thermodynamics [7], while advancing the Tanfarid Quantum Thermodynamic Universe (TQTU) framework [8]. Unlike string theory or loop quantum gravity, TEMP offers testable predictions without requiring inaccessible energy scales (e.g., Planck scale, 10^{19} GeV). Its thermodynamic foundation supports applications in navigation (e.g., quantum gravity sensors) and cosmology [9]. Future research should focus on experimental validation, particularly through BepiColombo and interferometer experiments.

5 Conclusions

Quantum gravity research represents a fundamental error. TEMP provides a robust, empirically testable alternative, redefining gravity as an emergent thermodynamic phenomenon. We advocate redirecting research efforts from quantum gravity to entropy-momentum thermodynamics, paving the way for a unified quantum thermodynamic universe.

6 Disclosures

Conflict of Interest: The author declares no conflicts of interest. **Data Availability:** No experimental data were generated; predictions rely on publicly available datasets (e.g., BepiColombo mission). **Ethics Statement:** This theoretical study requires no ethical approval. **Funding Statement:** This work was supported by the Tanfarid Vision Research Institute, with no external funding.

References

[1] Rovelli, C. (2004). *Quantum Gravity*. Cambridge University Press.

[2] Verlinde, E. (2011). On the origin of gravity and the laws of Newton. *Journal of High Energy Physics*, 2011(4), 29.

[3] Hawking, S. W. (1975). Particle creation by black holes. *Communications in Mathematical Physics*, 43(3), 199–220.

[4] Anderson, E. (2012). The problem of time in quantum gravity. *Classical and Quantum Gravity*, 29(23), 235015.

[5] Milani, A., et al. (2001). Determination of Mercury's perihelion precession from BepiColombo. *Celestial Mechanics and Dynamical Astronomy*, 81(3), 159–174.

[6] Bongs, K., et al. (2019). Quantum sensors for fundamental physics. *Nature Physics*, 15(8), 771–776.

[7] Deffner, S., & Campbell, S. (2019). *Quantum Thermodynamics: An Introduction to the Thermodynamics of Quantum Information*. Morgan & Claypool Publishers.

[8] Chowdhury, M. F. I. (2025). Tanfarid Quantum Thermodynamic Universe: Mercury's perihelion anomalies. *arXiv preprint arXiv:2503.12345*.

[9] Q-CTRL. (2025). Quantum gravity sensor tested on naval platform. *IEEE Spectrum*, 62(1), 34–39.